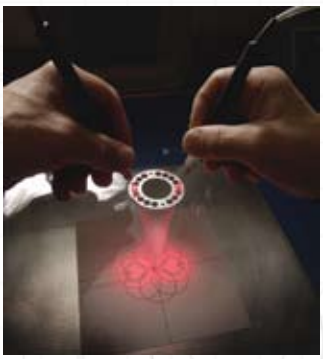
Advanced illumination

PRODUCT SOURCEBOOK

LED Lighting
&
Electronics

Image Experts for the Factory Floor

At Advanced illumination (Ai), we understand just how difficult it can be to choose the correct light source in order to acquire the best image for your applications. We built our business by focusing on the factory floor. Our mission is to make your challenges our challenges by providing complete service and support of tested and proven light sources using dependable solid state technology. Our vision is to become *the* trusted lighting source for factory automation professionals by partnering with the world's leading integrators, distributors, and developers of machine vision technology.



Advanced Lighting Technology

To help our customers implement a robust lighting solution, we developed the Flexible Response Product System® utilizing Evenlite™ technology and our Expandable Lighting products. The best lighting solution will increase the accuracy of your inspection and allow the camera to process clear digital images with speed and dexterity.

Advanced Control

Each Ai light is built with an internal electronic signature. Upon connection to a microprocessor-based SignaTech controller, the light signature is read and the controller automatically configures itself to output the optimum current level for a given pulse width. The SignaTech control system also applies to steady state, DC operation for those applications that do not require strobing.

Advanced Flexibility

Ai's Flexible Response Product System combines our best technological innovations: Flexibility begins with Standard Variations - standard product housings built with end-user choice of LED wavelength, power input, stand-off, working distance, and mounting options, *built within two weeks.* If a standard housing does not suit the application, our Expandable Lighting System offers standard lighting technology in sizes to match your needs. Evenlite technology allows structured lighting effects to be developed far more easily than in the past. And finally, Signatech and Signatech II control systems round out the Flexible Response Product System by maximizing interchangability between lighting and control components without compromising performance.

Table of Contents

Company Overview 2
Table of Contents/About Ai 3
Ai Technologies . . . . . 4 & 5
High Current Lighting 6
Expandable Lighting System 7

Product Families

Spot Lights 8
Broad Area Linear Arrays 9
Back Lights . . . . . Surface Mount 10
. . . . . Side Fired 11
Line Lights . . . . . Standard LED 12
. . . . . High Current LED 13
Ring Lights . . . . . Bright Field 14
. . . . . Dark Field 15
Diffuse Lights . . . . . Dome 16
. . . . . Axial Diffuse Illuminators 17
Current Regulators & Intensity Controllers . . . 18
Strobe Controllers 19
Electronics Ordering Chart 20
Machine Vision Basics . . . . . 21 & 22
Company Policies 23

About Ai

Since 1993, Advanced illumination has been a world leader in the design and manufacture of LED based lights for the machine vision industry. Featuring patented Evenlite LED aiming technology, Ai's extensive product line includes a number of exclusive designs, including RGB lightheads and Broad Area Linear Arrays.

Applications Lab Our applications lab can help you determine the most appropriate lighting for your inspection - free of charge. Simply send a sample and a completed questionnaire (*Send Us A Sample* on our web site) to "Applications Lab" at the address listed below, and we will email you a solution report with bitmapped images to evaluate using your own vision tools.

Evaluation Lights Our goal is to make sure your lighting provides optimal results. Once we've proven a solution in the lab, we offer lights for evaluation purposes - giving you two weeks to test the solution and decide if it meets your needs.

Contact Ai

Office Hours:
Monday - Friday
8:30 - 5:00 EST

24 Peavine Drive
Rochester VT 05767

phone: 802.767.3830
fax: 802.767.3831

Send information requests to: sales@advill.com

Advanced illumination designs the most innovative LED lighting systems in the world

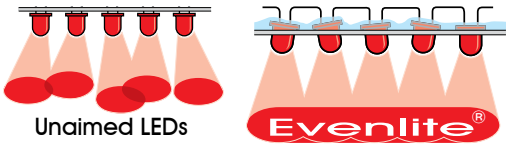
FREE Application Lab Support

FREE Light Evaluation Program

- Evenlite® LED Aiming Technology for optimized light consistency and flexibility
- More than 100,000 unique configurations to meet your exact specifications
- Signatech® smart electronics provide unrivaled control
- Expandable Lights built to custom sizes in 2 weeks!
- All lights can be configured to work with user supplied 24v

Evenlite®

Evenlite® is Ai's patented core LED aiming technology, enabling us to put light exactly where it is needed. Our proprietary targeting process provides the foundation for an extremely functional, consistent array of machine vision lights.



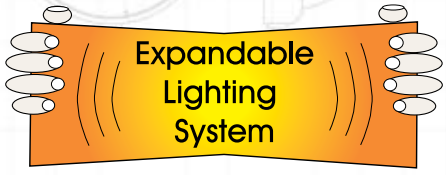
The LED manufacturing process often results in LEDs with diverging mechanical and optical axes. We aim every LED based on its optical axis, and by doing so overcome the uneven illumination found in other LED light sources. By aiming, we use fewer LEDs than competing products, resulting in lower operating temperatures. Under normal circumstances our products do not need cooling fans or heat sinking.

Evenlite II®

The newest aiming technology from Ai is Evenlite® II, used to maximize the output of high current LEDs. This new process allows us to create consistent illumination from greater distances and over larger areas than was previously possible with standard LEDs.

Expandable Lighting System

Proven light technologies in sizes built to fit your needs. That's the idea behind Ai's new line of Expandable Lighting products. Surface mount LED back lights, Broad Area Linear Arrays, and Line Lights are among the lights available in customized sizes: Built specifically for your application - in TWO WEEKS!



Look for this symbol, indicating Expandable Lighting Products!

Standard Variations

Customized Lights in 2 Weeks!

Our patented LED aiming process allows us to "soft customize" a light in two weeks or less. Customizable variables include working distance, field of view, wavelength, lensing, mounting, and powering options. Ai offers literally *thousands* of standard variations, built specifically to meet your needs.

Ai EXCLUSIVE RGB

Ai is the only LED machine vision lighting manufacturer building RGB lightheads. Combining red, green & blue LEDs makes a bright white that is color tunable for maximum image contrast. RGB lights have much longer lifespans than the white LEDs currently available .

The largest selection of controllers & electronic solutions in the Machine Vision Industry.

The power behind Ai's lights is an extensive range of supporting electronics: from current regulators to high speed strobes, and our new high output Pulsar for large light arrays and high current LED products. Signatech® – our proprietary signature recognition software - is built into all our electronics.

Controllers

Strobe Controllers - S4000, S6000 & S6000-AS

- S4000 (single) and S6000 (dual output) strobe controllers
- Independent channel control for 4 channels, and up to 4 amps per channel
- Three modes of operation (constant, trigger, test)
- S6000-AS offers asynchronous triggering for use on parallel production lines

Digital Channel Mixers - MS210, MS220, CS410 & CS420

- MS210 and MS220 controllers offer dual output control for color mixing
- CS410 and CS420 controllers provide dual independent intensity control (0-100%).
- MS220 and CS420 offer convenient onboard touchpad control.

Constant Current Controllers - CS100 & CS300

- Single or dual output current regulation. Optional intensity control.

Signatech®

Ai's microprocessor based Signatech® electronics verify the electronic signature of a light head and automatically adjust the maximum current output accordingly. This feature optimizes light output and LED life. New Signatech II expands the original capabilities for large arrays and high current LEDs.

EXCLUSIVE

Turbo-Charging

Increasing light intensity and extending LED life, Turbo-Charging is the process of precisely synchronizing high bursts of current, at a safe duty-cycle, through our lights during camera integration time. Turbo-charging maximizes the amount of information the camera receives in the shortest time possible.

NEW! Pulsar 710 NEW!

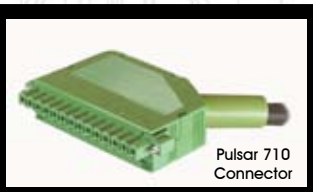
The newest Ai strobe controller offers high intensity output for large lighting arrays and high current LEDs. With a number of features designed to maximize the output of a wide range of lights, the new Pulsar provides:

- A stunning 100 amps at 100 volts total output in pulsed mode
- Multiple units that can be daisy chained from a single trigger source
- 8 amps at 24 volts in constant mode
- Four-channel outputs
- Signatech and Signatech II compatibility

Pulsar 710

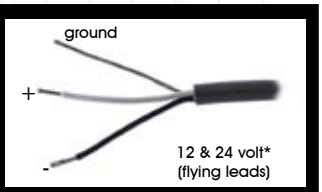
Ai Power Options

Most standard lights are configured for use with Ai electronics and are not designed to be connected directly to an unregulated 24v source. *Cutting the cable voids the warranty (see page 23).*



Pulsar 710 Connector

Standard Connector



12 & 24 volt* (flying leads)

High current lights can be configured for use with the Pulsar 710.

12 and 24 volt lights are built with flying leads, for use with any regulated 12 or 24v DC power source. Load limiting resistors ensure safe operation and long LED life.

*12 volt option is not available with all lights. Please see product spec sheets for details.

High Current LEDs

NEW PRODUCTS

Offering long range illumination and high intensity output, high current LEDs can be used in a wide range of machine vision applications. Ai offers a variety of styles to choose from.

DL072
1 High Current LED
Dim.: 94 x 32mm
(3.70 x 1.27")
F.O.V.: 25 x 25mm
(1.0" x 1.0")
Cable: 1.5 meters (4.9')
Standard Part:
DL072-WHI24-001

SL066
1 High Current LED
Dim.: 32mm x 23.9mm
(1.26" x .94")
F.O.V.: 65mm (2.5")
Custom Product
Call for Details

LL068
6 High Current LEDs
Illum. Length: 305mm (12.0")
Housing Length: 342.9mm
(13.5")
Cable: 1.5 meters (4.9')
Standard Part:
LL068-WHI24-002

SL073
1 High Current LED
O.D.: 152mm (6.0")
I.D.: 57mm (2.25")
F.O.V.: 130mm (5.0")
Cable: 1.5 meters (4.9')
Standard Part:
SL073-WHI24-001

Lighting Tip:

Did you know Turbo-Charged Strobing can overcome ambient light contribution, even when white light must be used?

All High Current LED Lighting Products are available in the following wavelengths: 470nm (blue); 530nm (green); 625 (red); and WHI (white).

Expandable Lighting System

ELS (Expandable Lighting System)

Ai's Expandable Lighting System products combine proven lighting technology with the flexibility of a light sized to meet your specific application needs. ELS lights are simply custom sized versions of our standard lights.

NEW PRODUCT

EL150
Broad Area Linear Array Technology - page 9
EL174
High Current Linear Array - page 13
Surface Mount LED Back Lights - page 10
High Current LED Line Lights - page 12
LL068
BLXXYY01
EL193
Back Light Strips - page 10

EL150
Broad Area Linear Array
Housing Width: 34mm (1.33")
Length Increments: 25mm (1")
Max. Length: 2032mm (80")
Cable: 1.5 meters (4.9')

EL174
High Current LED Line Light
Housing Width: 34mm (1.33")
Length Increments: 25mm (1")
Max. Length: 1829mm (72")
Cable: 1.5 meters (4.9')

LL068
High Current LED Line Light
Housing Width: 40.9mm (.1.61")
Length Increments: 152mm (6")
Max. Length: 2438mm (96")
Cable: 1.5 meters (4.9')

BLXXYY01
Surface Mount LED Back Light
Length Increments: 25mm (1")
Max. Illuminated area:
1778mm x 1778mm (70"x70")
Cable: 1.5 meters (4.9')

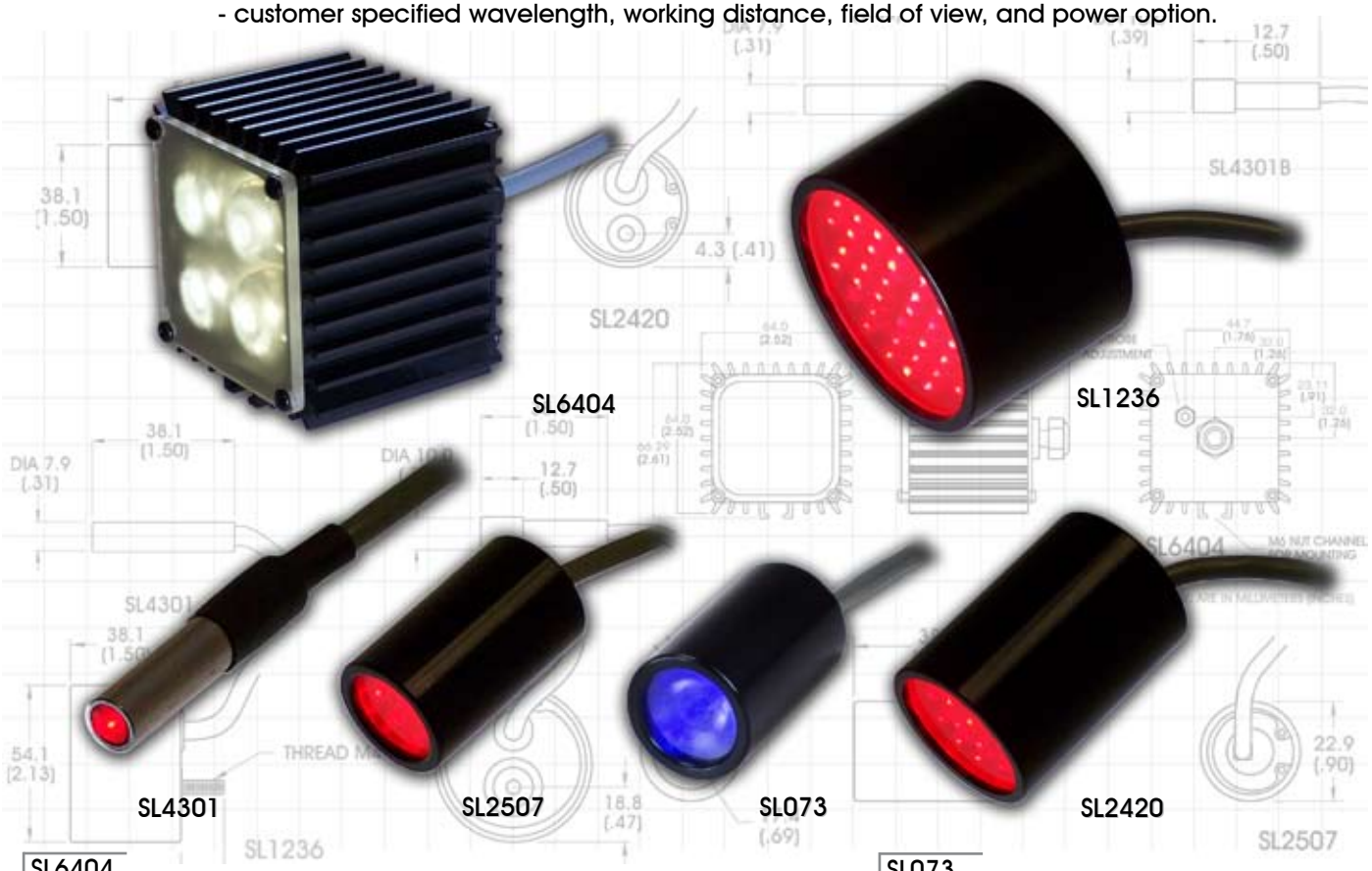
EL193
Back Light Strip Light
Housing Width: 34mm (1.33")
Length Increments: 25mm (1")
Max. Length: 2032mm (80")
Cable: 1.5 meters (4.9')

- Same Day Quotes
- 5 different light types to choose
- Larger sizes may require Pulsar 710 or customer supplied 24v power supply
- Lengths: LL068 up to 96"; EL174 and EL150 up to 80"; or as large as 70" x 70" for back lights
- Please consult with our engineers to ensure you order the correct light for your needs

For specific ordering information, please see individual spec sheets.

Spot Lights

Ai's Spot Lights provide significantly uniform illumination for creating high contrast. Standard configurations are shipped next day, or within two weeks when ordered as a Standard Variation - customer specified wavelength, working distance, field of view, and power option.



SL6404
4 High Current LEDs
O.D.: 64mm (2.51")
F.O.V.: 65mm (2.5")
Cable: 1.5 meters (4.9')
Standard Part:
SL6404-WHI300M

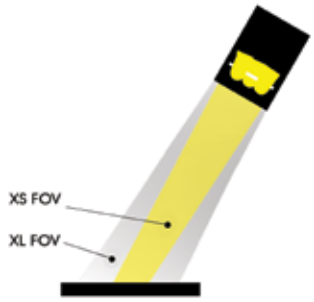
SL1236
36 LEDs
O.D.: 54mm (2.12")
F.O.V.: 45mm (1.8")
Cable: 1.5 meters (4.9')
Standard Part:
SL1236-660100L

SL4301
1 LED
O.D.: 8mm (.31")
Cable: 1.5 meters (4.9')
Standard Part:
SL4301-660

SL2507
7 LEDs
O.D.: 23mm (.90")
F.O.V.: 30mm (1.2")
Cable: 1.5 meters (4.9')
Standard Part:
SL2507-66075L

SL073
1 High Current LED
O.D.: 23mm (.90")
F.O.V.: 30mm (1.2")
Cable: 1.5 meters (4.9')
Standard Part:
SL073-WHI24-001

SL2420
20 LEDs
O.D.: 38mm (1.5")
F.O.V.: 45mm (1.8")
Cable: 1.5 meters (4.9')
Standard Part:
SL2420-660100L



Light Function Diagram

- Compact designs
- High intensity illumination for non-specular objects
- Can be ordered to light a given field of view from a specified distance
- SL1236 is available in an RGB "all color" version

Lighting Tip:

Problem with ambient light? Try a monochrome light, such as red, with a matched red 660nm band pass filter attached to your camera lens.

All 5mm LED spot lights are available in the following wavelengths: 470nm (blue); 520nm (green); 590nm (yellow); 625nm (orange); 660nm (red); 880nm (infra-red); and WHI (white). The SL1236 is also offered in RGB (red, green, blue) "all color" versions.
The high current SL6404 and SL073 are available in the following wavelengths: 470nm (blue); 530nm (green); 625nm (red); and WHI (white).

Broad Area Linear Arrays

Ai's unique Broad Area Linear Arrays (BALA) are designed to provide a long, wide field of illumination with controlled "fall off" in the transverse direction. Originally designed for inspecting circuit boards, these versatile lights can be applied in both dark field and bright field situations. The EL150 is available in lengths up to 80".

Expandable Lighting System

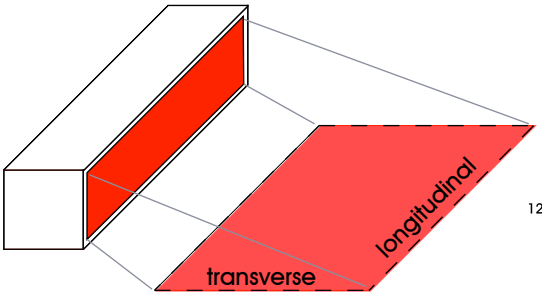
AL4424
4" Length/24 LEDs
Housing Length: 119mm (4.72")
Illuminated Length: 117mm (4.6")
Cable: 1.5 meters (4.9')
Standard Part: AL4424-660

AL4554
9" Length/54 LEDs
Housing Length: 249mm (9.82")
Illuminated Length: 246mm (9.70")
Cable: 1.5 meters (4.9')
Standard Part: AL4554-660

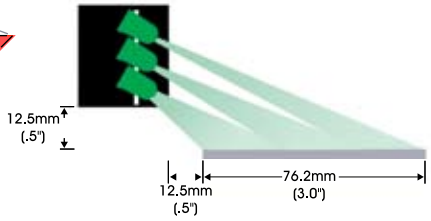
AL46120
20" Length/120 LEDs
Housing Length: 534mm (21.04")
Illuminated Length: 531mm (20.93")
Cable: 1.5 meters (4.9')
Standard Part: AL46120-660

EXPANDABLE!

EL150
Expandable BALA
Housing Width: 33mm (1.33")
Length Increments: 25mm (1")
Max. Length: 2032mm (80")
Cable: 1.5 meters (4.9')



Light Function Diagram



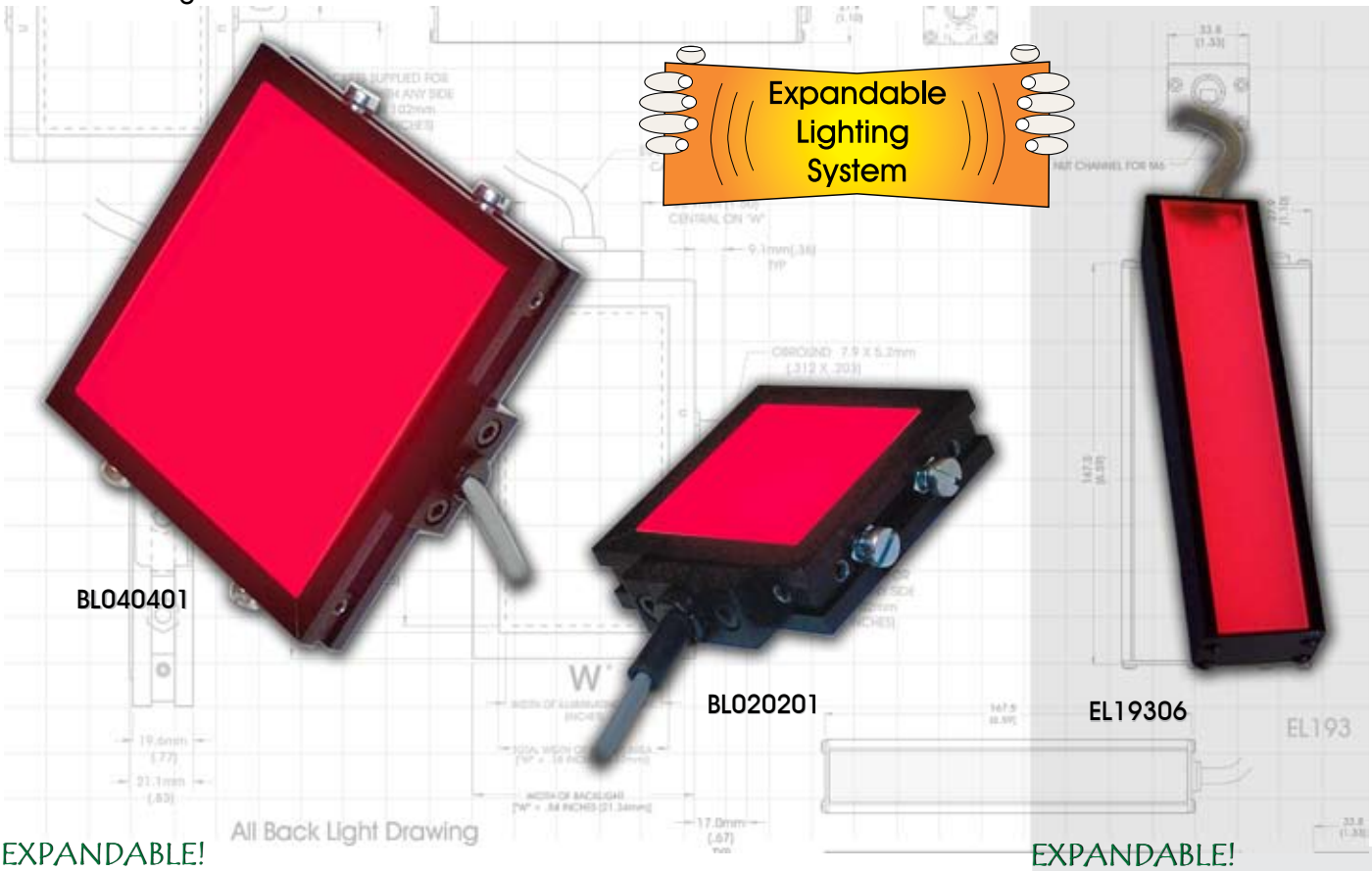
Recommended BALA Set Up

- Low angle incidence illumination over a long, wide area
- Extremely even illumination over the full lighted length, with controlled "fall off" in the transverse direction
- For wider coverage, two BALAs can be aligned opposite to and facing each other

All Broad Area Linear Arrays are available in the following wavelengths: 470nm (blue); 520nm (green); 590nm (yellow); 625nm (orange); 660nm (red); 880nm (infra-red); and WHI (white).

Surface Mount LED Back Lights

Surface mount LED back lights provide significant uniformity over the entire active area of illumination. BL models feature an integral nut channel for easy mounting (brackets are also included) and can be ordered in 1" increments up to 70" x 70". The EL193 can be ordered in 1" increments up to 80" in length.



EXPANDABLE!

BLXXYY01
Surface Mount LED Back Light
Length/Width Increment: 25mm (1")
Max. illuminated Size:
1778mm x 1778mm (70"x70")
Cable: 1.5 meters (4.9')

- Sizes up to 70" x 70"
- Choice of red or infra-red
- Fast Mounting option with M6 nut channel

BL040401
192 LEDs
Dim.: 123mm x 123mm
(4.84 x 4.84")
F.O.V.: 100mm square (4")
Cable: 1.5 meters (4.9')
Standard Part:
BL040401-660

BL020201
48 LEDs
Dim.: 72mm x 72mm
(2.84 x 2.84")
F.O.V.: 50mm square (2")
Cable: 1.5 meters (4.9')
Standard Part:
BL020201-660

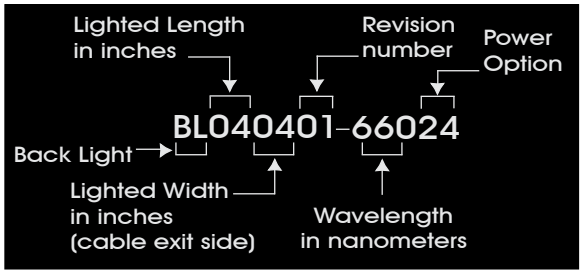
EXPANDABLE!

EL193
Back Light Strip
Lighted Width: 25mm (1.0")
Housing Width: 33mm (1.33")
Length Increments: 25mm (1")
Max. Length: 2032mm (80")
Cable: 1.5 meters (4.9')

- Lengths up to 80"
- Fast mounting option with M6 nut channel
- Choice of red or infra-red

Build Your Own Back Light:

Creating a Surface Mount Back Light Part Number



Lighting Tip:

The human eye sees differently than a vision system. When it comes to testing a lighting solution, always judge the lights based on what the camera sees.

Light Function Diagram

All Surface Mount Back Lights are available in the following wavelengths: 660nm (red); and 880nm (infra-red).

Back Lights

Side Fired

A reliable option for measuring, placement or sorting applications, Ai Back Lights are built using Evenlite LED aiming technology. Standard lights are shipped next day; Standard Variations, with customer specified color or power options, ship within two weeks.

BL41192
192 LEDs
Housing: 230 x 207mm
(9.06 x 8.16")
F.O.V.: 203 x 152mm
(8 x 6")
Cable (x2): 1.5 meters (4.9')
Standard Part:
BL41192-660

BL47192*
192 LEDs
Housing: 256 x 256mm
(10.1 x 10.1")
F.O.V.: 203 x 203mm
(8 x 8")
Cable (x2): 1.5 meters (4.9')
Standard Part:
BL47192-660

BL18120*
120 LEDs
Dim.: 230mm x 157mm
(9.06 x 6.16")
F.O.V.: 203 x 101mm
(8 x 4")
Cable (x2): 1.5 meters (4.9')
Standard Part:
BL18120-660

BL1520
20 LEDs
Housing: 95 x 78mm
(3.72 x 3.05")
F.O.V.: 50 x 50mm
(2 x 2")
Cable: 1.5 meters (4.9')
Standard Part:
BL1520-660

BL5420
20 LEDs
O.D.: 38mm (1.5")
F.O.V.: 4mm or 20mm
(.18") or (.79")
Cable: 1.5 meters (4.9')
Standard Part:
BL5420-6604

BL2850*
50 LEDs
Dim.:183 x 88mm
(7.23 x 3.47)
F.O.V.: 44 x 152mm
(1.75 x 6")
Cable: 1.5 meters (4.9')
Standard Part:
BL2850-660

BL1960
60 LEDs
Dim.:156 x 128mm
(6.16 x 5.06")
F.O.V.: 101 x 101mm
(4" x 4")
Cable: 1.5 meters (4.9')
Standard Part:
BL1960-660

*not shown

Light Function Diagram

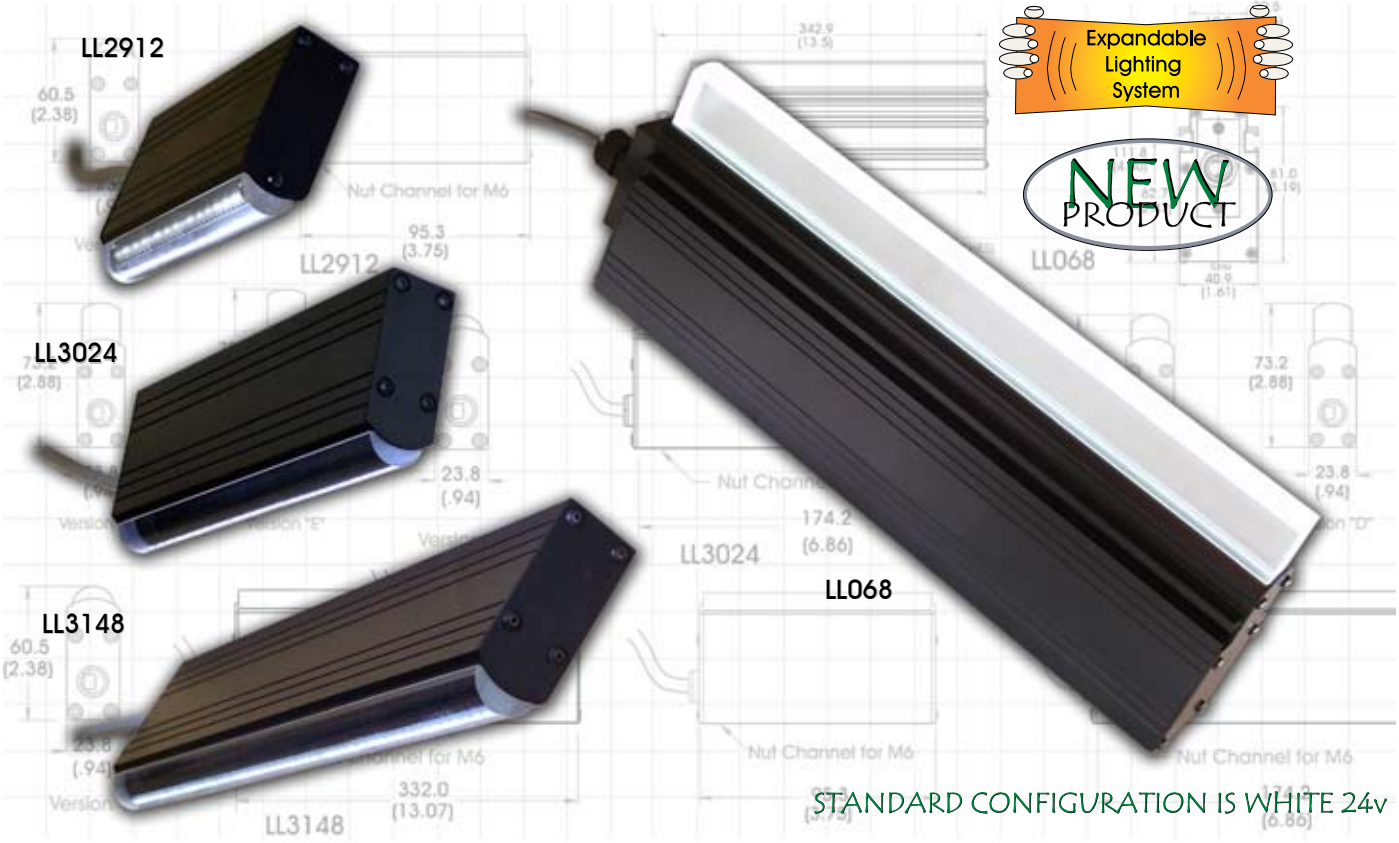
Lighting Tip:
Sometimes light color is the key to creating greater contrast. Changing the wavelength of the light can be an easy and inexpensive way to improve your inspection. *(See page 21)*

- Low profile housings
- Available in a wide range of wavelengths
- For use in DC Continuous and strobed applications

All side fired back lights are available in the following wavelengths: 470nm (blue); 520nm (green); 590nm (yellow); 625nm (orange); 660nm (red); and 880nm (infra-red).

Line Lights

Ai's Line Lights provide a narrow band of intense illumination for use in web inspections or in non-specular applications requiring a long, thin field of view. Two different designs are available in four standard sizes, or custom lengths up to 96" for the LL068 or 80" for the EL163.



STANDARD CONFIGURATION IS WHITE LEDs WITH AI CONNECTOR

LL2912
3" Length
12 LEDs
Illuminated Length: 76mm (3.0")
Housing Length: 95mm (3.75")
Cable: 1.5 meters (4.9')
Standard Part:
LL2912A-WHI

LL3024
6" Length
24 LEDs
Illuminated Length: 152mm (6")
Housing Length: 174mm (6.86")
Cable: 1.5 meters (4.9')
Standard Part:
LL3024A-WHI

LL068
12" Length
12 High Current LEDs
Illuminated Length: 305mm (12.0")
Housing Length: 308.1mm (12.13")
Cable: 1.5 meters (4.9')
Standard Part:
LL068-WHI24-002

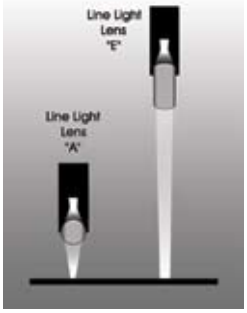
EXPANDABLE!

LL068
High Current LED LIne Light
Housing Width: 40.9mm (1.61")
Length Increments: 152mm (6.0")
Max Length: 2438mm (96")
Cable: 1.5 meters (4.9')

LL3148
12" Length/48 LEDs
Illuminated Length: 305mm (12")
Housing Length: 332mm (13.07")
Cable: 1.5 meters (4.9')
Standard Part:
LL3148A-WHI

EXPANDABLE!

EL163
Standard LED Line Light
Housing Width: 24mm (.94")
Length Increments: 38mm (1.5")
Max. Length: 2032mm (80")
Cable: 1.5 meters (4.9')



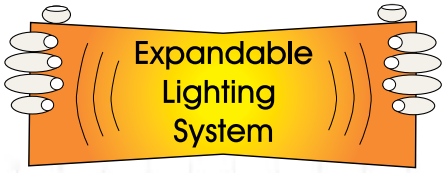
Light Function Diagram

- Ideally suited for use with line-scan applications
- Standard lengths, or build your own with the EL163 and LL068
- ELS lengths up to 80"; LL068 lengths to 96"

All 5mm LED line lights are available in the following wavelengths: 470nm (blue); 520nm (green); 590nm (yellow); 625nm (orange); 660nm (red); 880nm (infra-red); and WHI (white). The LL068 is available in the following wavelengths: 470nm (blue); 530nm (green); 625nm (red); and WHI (white).

Linear Array Lights

High Current LEDs



Ai's high current LED Line Lights provide significant illumination for web applications, and can be used for larger area inspections such as robotic work cells. Three standard sizes are available, plus the EL174, which can be ordered in lengths up to 72".

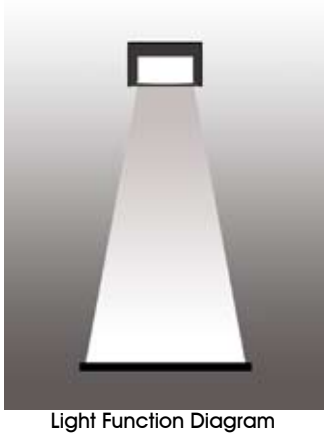
LL5806
6 High Current LEDs
Illuminated Length: 152mm (6.0")
Housing Length: 171mm (6.74")
Cable: 1.5 meters (4.9')
Standard Part:
LL5806-WHI24

LL6212
12 High Current LEDs
Illuminated Length: 304mm (12.0")
Housing Length: 322mm (12.7")
Cable: 1.5 meters (4.9')
Standard Part:
LL6212-WHI24

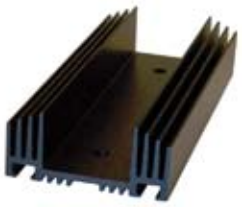
LL6324
24 High Current LEDs
Illuminated Length: 609mm (24.0")
Housing Length: 627mm (24.7")
Cable: 1.5 meters (4.9')
Standard Part:
LL6324-WHI24

EXPANDABLE!

EL174
High Current LED Linear Array
Housing Width: 33mm (1.33")
Max. Length: 1829mm (72")
Cable: 1.5 meters (4.9')



Light Function Diagram



For high current LED line lighting situations that require additional heat dispersion, Ai offers an optional heat sink.

- High intensity illumination from a long distance
- Useful for large area lighting
- Easy mounting via M6 nut channel
- Optional heat sink available

All High Current LED Line Lights are available in the following wavelengths: 470nm (blue); 530nm (green); 625nm (red); and WHI (white).

Ring Lights
Bright Field

Ai's Ring Lights feature Evenlite LED aiming technology, and can be ordered in both off-the-shelf, standard configuration for next day shipping, or as a Standard Variation - your specified working distance and field of view, wavelength and power configuration - within two weeks.

RL2316

RL1424

RL6512

RL4260

RL36120

RL2316
16 LEDs
I.D.: 23mm (.92")
O.D.: 54mm (2.15")
F.O.V.: 45mm (1.7")
Cable: 1.5 meters (4.9')
Standard Part:
RL2316-660100L

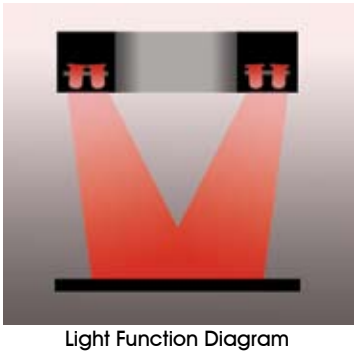
RL1424
24 LEDs
I.D.: 55mm (2.18")
O.D.: 84mm (3.33")
F.O.V.: 45mm (1.7")
Cable: 1.5 meters (4.9')
Standard Part:
RL1424-660100L

RL4260
60 LEDs
I.D.: 55mm (2.18")
O.D.: 100mm (4.0")
F.O.V.: 45mm (1.7")
Cable: 1.5 meters (4.9')
Standard Part:
RL4260-660100L

RL36120
120 LEDs
I.D.: 55mm (2.18")
O.D.:126mm (4.98")
F.O.V.: 135mm (5.3")
Cable: 1.5 meters (4.9')
Standard Part:
RL36120-660200XL

RL6512
12 High Current LEDs
I.D.: 57mm (2.25")
O.D.: 152mm (6")
F.O.V.: 130mm (5")
Cable: 1.5 meters (4.9')
Standard Part:
RL6512-WHI300M24

- Convenient around the lens mounting - most lights accommodate lenses up to 55mm in diameter

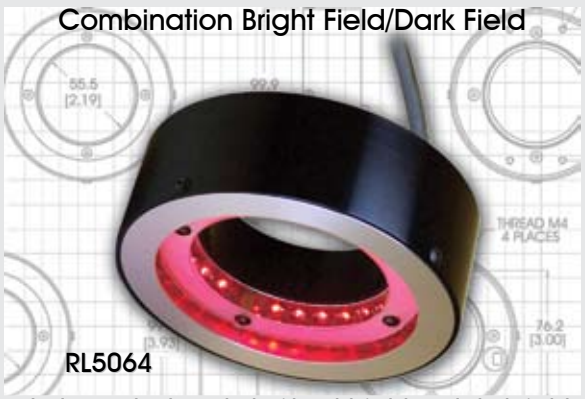


Light Function Diagram

- Co-axial light source designed for use in non-specular inspections
- Mounting options include barrel, C, and brackets

RL5064
64 LEDs
I.D.: 55mm (2.18")
O.D.: 100mm (4.0")
F.O.V.: 44mm (1.75")
Cable: 1.5 meters (4.9')
Standard Part:
RL5064-660

Combination Bright Field/Dark Field



RL5064

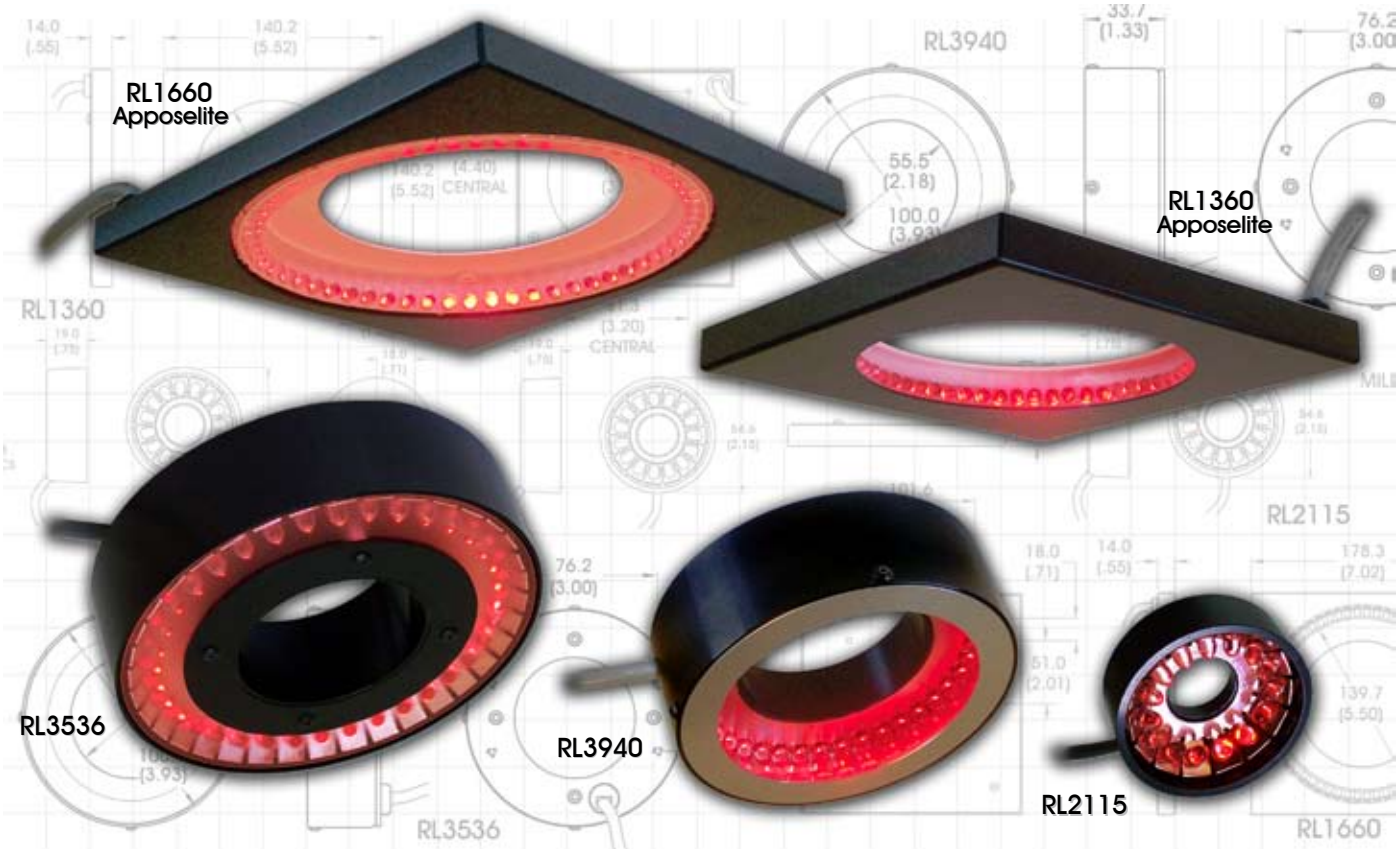
Independent control of bright field and dark field rings when used with the MS210, MS220, S4000, S6000 or S6000-AS.

All 5mm LED ring lights are available in the following wavelengths: 470nm (blue); 520nm (green); 590nm (yellow); 625nm (orange); 660nm (red); 880nm (infra-red); and WHI (white). The RL4260 and RL36120 are also offered in RGB (red, green, blue) "all color" versions. The high current RL6512 is available in 470nm (blue); 530nm (green); 625nm (red); and WHI (white).

Ring Lights

Dark Field

Ai's Dark Field Ring Lights include both standard (45°) and low angle dark field options. These lights are ideal for the inspection of etched code or detection of surface flaws on highly reflective materials.



RL1660	RL1360	RL3536	RL3940	RL2115
60 LEDs	60 LEDs	36 LEDs	40 LEDs	15 LEDs
I.D.: 101mm (4.0")	I.D.: 101mm (4.0")	I.D.: 55mm (2.18")	I.D.: 55mm (2.18")	I.D.: 19mm (.74")
O.D.: 178mm (7.01")	O.D.:140mm (5.51")	O.D.: 126mm (4.98")	O.D.: 100mm (3.93")	O.D.: 54mm (2.14")
F.O.V.: 35mm (1.4")	F.O.V.: 25mm (1.0")	F.O.V.: 35mm (1.4")	F.O.V.: 35mm (1.4")	F.O.V.: 12mm (.5")
Cable: 1.5 meters (4.9')	Cable: 1.5 meters (4.9')	Cable: 1.5 meters (4.9')	Cable: 1.5 meters (4.9')	Cable: 1.5 meters (4.9')
Standard Part: RL1660-66035	Standard Part: RL1360-66025	Standard Part: RL3536-660	Standard Part: RL3940-660	Standard Part: RL2115-660

Light Function Diagram

Lighting Tip:

Because of its longer wavelength, IR light is useful for penetrating plastics in both front and back lighting applications.

- Excellent for detecting edges in a 360° inspection on any surface
- Surface flaw detection on highly specular surfaces
- Apposelites are well suited to circuit board and BGA inspections

All dark field ring lights are available in the following wavelengths: 470nm (blue); 520nm (green); 590nm (yellow); 625nm (orange); 660nm (red); 880nm (infra-red); and WHI (white). The RL3536 is also available in an RGB "all color" configuration.

Diffuse Dome Lights

Ai's Dome Lights offer traditional diffuse illumination for highly reflective items in a wide range of sizes, including the DL51120 for cylindrical inspections and the DL071 for large objects.

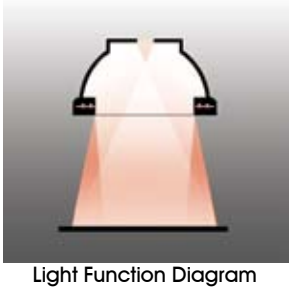
DL2230
30 LEDs
O.D.: 71mm (2.83")
F.O.V.: 49mm (1.9")
Aperture: 19mm (.74")
Cable: 1.5 meters (4.9')
Standard Part:
DL2230-660

DL7248
48 LEDs
O.D.: 133mm (5.24")
F.O.V.: 85mm (3.3")
Aperture: 19mm (.74")
Cable: 1.5 meters (4.9')
Standard Part:
DL7248-660

DL9160
120 LEDs
O.D.: 226mm (8.92")
F.O.V.: 161mm (6.3")
Aperture: 25mm (1.0")
Cable (x2): 1.5 meters (4.9')
Standard Part:
DL9160-660

DL071
24 High Current LEDs
O.D.: 535 x 535mm
(21.07 x 21.07")
F.O.V.: 450 x 450mm
(17.7 x 17.7")
Aperture: 50mm (2.0")
Cable: 1.5 meters (4.9')
Standard Part:
DL071-WHI24-001

DL51120
120 LEDs
O.D.: 77 x 348mm
(3.06 x 13.72")
F.O.V.: 25 x 345mm
(1.0 x 13.6")
Aperture: 4 x 345mm
(.15 x 13.61")
Cable: 1.5 meters (4.9')
Standard Part:
DL51120-660


Light Function Diagram

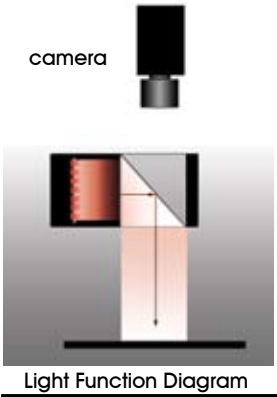
- Evenly diffuse illumination over full field of view
- Fields of view from 49mm (1.95") to 450mm (17.72")
- Well-suited for inspecting shiny, curved surfaces
- Rugged construction

All 5mm LED diffuse lights are available in the following wavelengths: 470nm (blue); 520nm (green); 590nm (yellow); 625nm (orange); 660nm (red); 880nm (infra-red); and WHI (white). The DL7248 and DL9160 are also offered in RGB (red, green, blue) "all color" versions. The DL071 (high current LEDs) is available in 470nm (blue); 530 (green); 625nm (red); and WHI (white).

Axial Diffuse Illuminators

Axial Diffuse Illuminators provide extremely uniform illumination for the inspection of reflective objects. Ai offers four sizes that can be shipped next day when ordered in the standard configuration, or can be ordered as a Standard Variation - customer specified wavelength and power options, in two weeks.

DL3316	DL072	DL2449	DL37100	DL38144
16 LEDs	1 High Current LED	48 LEDs	100 LEDs	144 LEDs
Dim.: 94 x 32mm (3.70 x 1.27")	Dim.: 94 x 32mm (3.70 x 1.27")	Dim: 116 x 57mm (4.59 x 2.27")	Dim.:155 x 90mm (6.11 x 3.55")	Dim.: 177 x 110mm (6.99 x 4.33")
F.O.V.: 25 x 25mm (1.0 x 1.0")	F.O.V.: 25 x 25mm (1.0 x 1.0")	F.O.V.: 50 x 50mm (2.0 x 2.0")	F.O.V.: 75 x 75mm (3.0 x 3.0")	F.O.V.:100 x 100mm (4.0 x 4.0")
Cable: 1.5 meters (4.9')	Cable: 1.5 meters (4.9')	Cable: 1.5 meters (4.9')	Cable: 1.5 meters (4.9')	Cable (x2): 1.5 meters (4.9')
Standard Part: DL3316-660	Standard Part: DL072-WHI24-001	Standard Part: DL2449-660	Standard Part: DL37100-660	Standard Part: DL38144-660



Light Function Diagram

- Evenly diffuse illumination over full field of view
- High efficiency, coated "easy clean" dust cover protects beam splitter glass
- Heat sinking of LEDs eliminates need for cooling fans, providing vibration-free performance
- Well-suited for use in inspecting uneven, angled or textured flat surfaces

Lighting Tip:

Diffuse lights are intended for use at a relatively close working distance. The field of view shrinks and intensity decreases as the light is pulled away from the surface.

All axial diffuse illuminators are available in the following wavelengths: 470nm (blue); 520nm (green); 590nm (yellow); 625nm (orange); 660nm (red); 880nm (infra-red); and WHI (white). The DL2449 is also available in an RGB "all color" configuration. The high current DL072 is available in the following wavelengths: 470nm (blue); 530nm (green); 625nm (red); and WHI (white).

Electronic Controllers

Current Regulators and Intensity Controllers

Ai's DC controllers range from single and dual output constant current regulators to four channel intensity controllers with built-in control panels, offering a wide choice of options for light management, including color manipulation of RGB lights.

CS410
Dual Independent Outputs
Intensity Controller

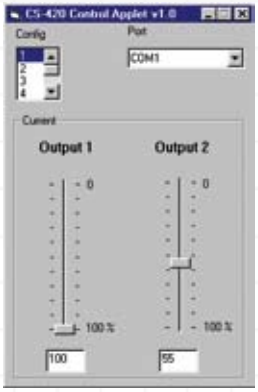
CS420
Dual Independent Outputs
Touchpad Manual Controls
Intensity Controller

CS100
Single Output
Constant Current
w/Optional Intensity Control:
CS100-IC

CS300
Dual Output
Constant Current
w/Optional Intensity Control:
CS300-IC

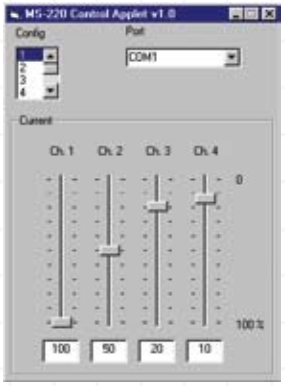
MS210
Dual Slaved Outputs
Channel Controller

MS220
Dual Slaved Outputs
Touchpad Manual Controls
Channel Controller



CS410/CS420

- Graphical user interfaces provide simple to use control of our intensity controllers. All software and cables are provided with Ai electronic products
- Intensity is expressed as a percentage of 0-100%



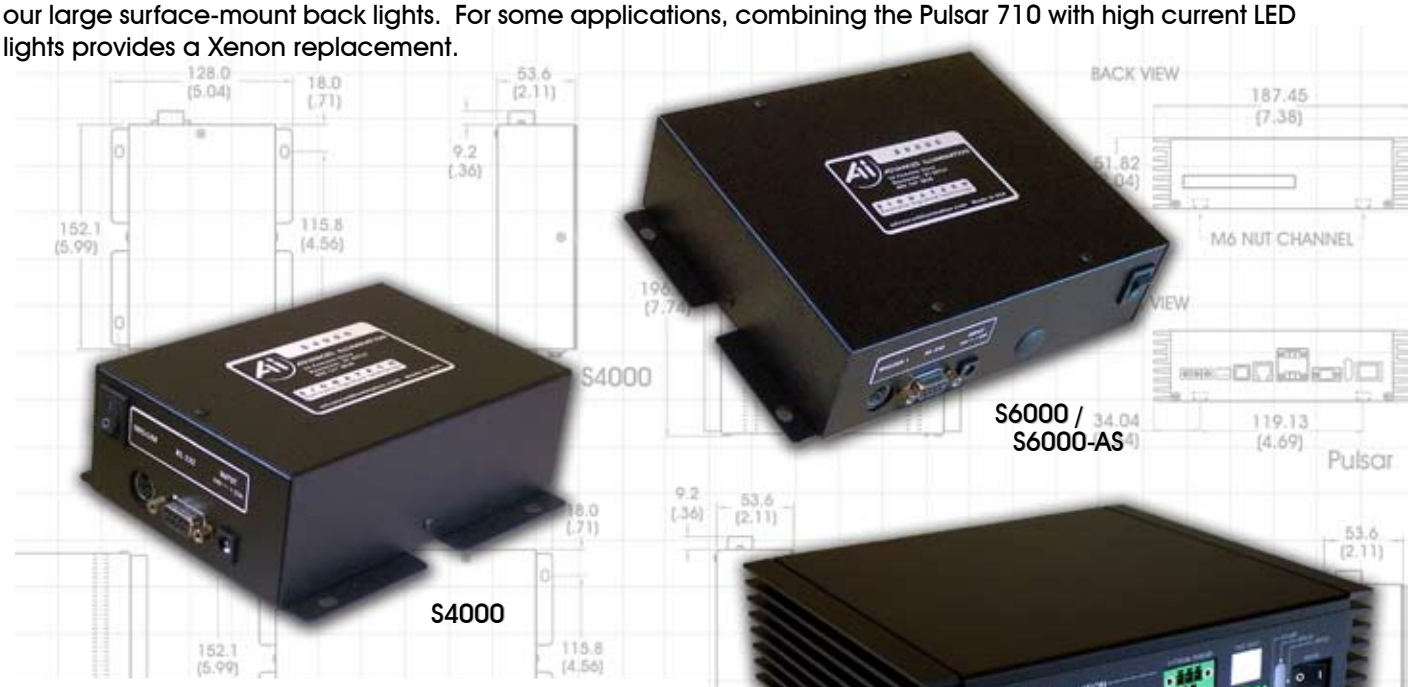
MS210/MS220

- Signatech Signature Recognition Technology for optimal safe light performance and long LED life
- Enclosures feature optimal thermal management

Ai's intensity and strobe controllers offer a range of functionality to match the needs of even the most demanding application. Settings are made through an easy to use graphical interface and RS-232 communication port; the CS420 and MS220 provide built-in digital touchpad control.

Strobe Controllers

Ai's strobe controllers - S4000, S6000, S6000-AS, and the high output Pulsar 710 - provide dependable and flexible strobe and DC continuous control for Ai's entire line of LED illuminators. The Pulsar 710 is targeted for applications using the newest generation of high current LED light heads, and larger arrays including our large surface-mount back lights. For some applications, combining the Pulsar 710 with high current LED lights provides a Xenon replacement.



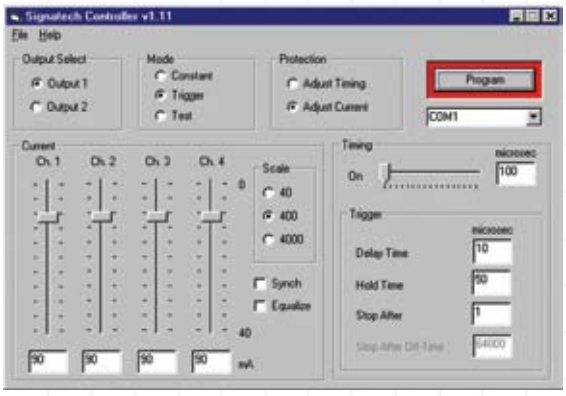
- Safely over-drive LEDs for greater intensity
- Stop action in high speed inspections
- Extended LED life through strobing

S4000
Single Output
Single Trigger Input
Strobe Controller

S6000
Dual Output
Single Trigger Input
Strobe Controller

S6000-AS
Dual Output
Dual Asynchronous
Trigger Input
Strobe Controller

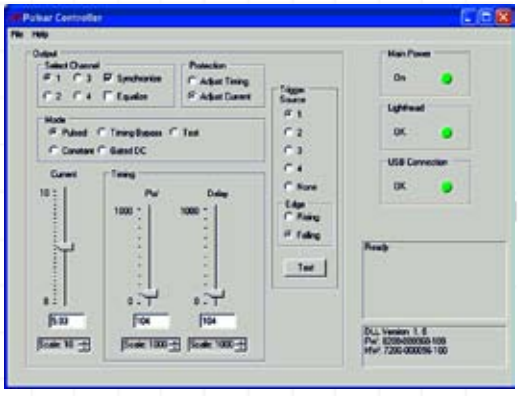
Pulsar 710
4 Channel Output
High Current
Strobe Controller



S4000/S6000

* 3 modes of operation
* Independent channel control
* Up to 4 watts per channel

* 5 modes of operation
* 100 amps @ 100 volts (pulsed)
* 8 amps @ 24volts (constant)



Pulsar 710

Ai's strobe controllers provide a range of functionality to match the needs of even the most demanding application. Settings are made through an easy to use graphical interface and RS-232 communication port, or for the Pulsar 710, via USB as well as EIA/TIA232/RS485 compliant interface.

Quick Reference: CHOOSING ELECTRONICS

START

Various factors determine the type of power supply/controller your application requires. The chart below is designed to help you choose which product best suits your needs.

Are you supplying your own 24v DC? YES / NO

Are you powering High Current LEDs?* YES / NO

Do you need to strobe? YES / NO

Do you need intensity control? YES / NO

Do you need more than one output? YES / NO

- YES → *CS100*

- NO → *CS300*

Do you need a programmable controller? YES / NO

Do you need more than one output? YES / NO

- YES → *CS100-IC*

- NO → *CS300-IC*

Do you need individual channel control? YES / NO

Do you need a digital front panel interface? YES / NO

- YES → *CS410*

- NO → *CS420*

Do you need a digital front panel interface? YES / NO

- YES → *MS210*

- NO → *MS220*

Do you need more than one output? YES / NO

- YES → *S4000*

Do you need individual output triggers? YES / NO

- YES → *S6000*

- NO → *S6000-AS*

- NO → *Pulsar 710*

*Greater than 4 Amps strobe or 300mA

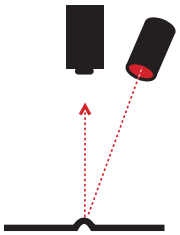
Order Light with '24' suffix (see page 5) ex. RL4260-660110L24

The first step in designing and implementing a successful automated inspection process is selecting the proper illumination.

Lighting is the most cost effective and versatile element to consider when attempting to solve an application. More importantly, good lighting is required because a vision system, unable to differentiate subtle differences in appearance, needs consistent contrast levels to provide reliable results. (A general rule of thumb is that the vision system requires a minimum 20% contrast in order to perform effectively.) Even the best software depends on high quality data in order to perform efficiently; results are less dependable when the software is required to compensate for missing or potentially inaccurate information.

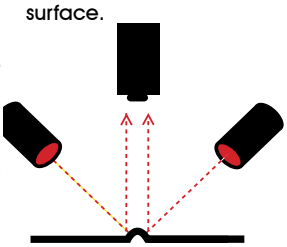
The goal of selecting illumination is to create a consistent, robust environment in which to perform inspections.

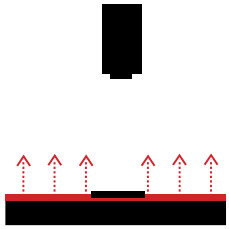
Common Lighting Techniques



Direct Light: Light is aimed directly at an object, often creating distinct shadows. This type of lighting is effective when used on objects requiring high contrast, but creates specular reflections when used with shiny or reflective materials.

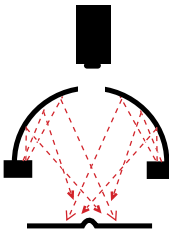
Dark Field: Light is projected at an angle to the surface, causing any variations to deflect light up into the camera, creating bright spots on a dark background or field. Nothing is seen by the vision system if there are no aberrations on the surface.

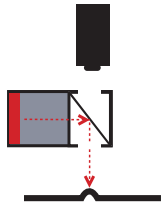




Backlighting: An even field of illumination is projected from behind an object. The object is seen as a silhouette by the camera. Backlighting is most commonly used for taking measurements or determining orientation of parts.

Diffuse Light: Reflected light, providing a non-directional, soft light free of harsh shadows that is well suited for highly specular objects. This illumination effect has been likened to the type of flat, non-directional light found on an overcast day.





Co-Axial Illumination: A variation of diffuse light in which a perpendicular wall of light is aimed at an angled beam splitter that reflects the light down. The object is viewed from above through the beam splitter. This light type is particularly helpful on highly reflective objects or in situations where the area of inspection is obscured by shadows from it's surroundings.

Each light type has a specific purpose, but is also adaptable for a range of applications not immediately related to its function. (For example, a spotlight, which provides direct light, can be placed at an angle to create a dark field effect.) For some applications, the best results are achieved by combining multiple light types.

Modifying Light

After selecting the light type, a number of techniques can be employed to optimize inspection results:

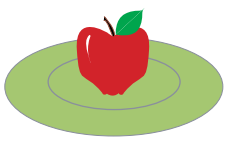
Color

The best light color for an inspection depends on two elements, the color of the object being inspected, and the sensitivity of the CCD.

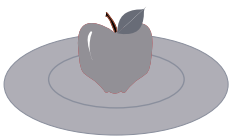
Color CCDs generally require a white illumination source - though not always - while a black and white inspection can be enhanced by experimenting with various colors to increase contrast. The color wheel to the right is a useful tool in determining color choice.

Rule of thumb: The highest degree of contrast is achieved when using opposing colors on the color wheel. "Cool" colors darken "warm" colors and lighten other "cool" colors.

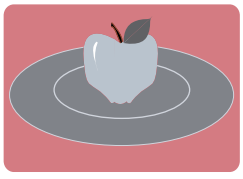
The apples to the right illustrate how different colors react in a black and white inspection. Changing the light color can greatly enhance the contrast.



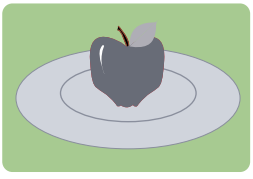
An Apple



Under Normal Light



Under Red Light



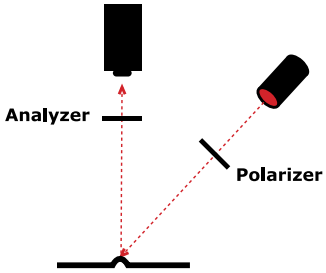
Under Green Light

RGB

Using an “all color” RGB - red, green, blue light - offers several advantages over a standard monochrome or white spectrum light. When coupled with our MS210/220 multi-channel controller, an RGB light head can produce the entire visible spectrum of colors by independently adjusting the R, G, or B intensity values. This feature allows the operator to modify contrast based on relative color absorption versus reflection. Additionally, when all three channels are set to equal intensities, the light head produces a white light that is approximately 2x the intensity of current white LED light offerings.

Filters

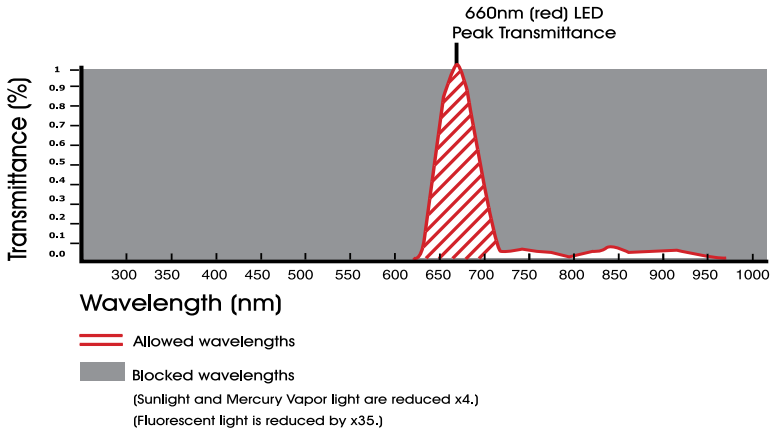
The ability to control what the vision system sees determines the efficiency of an inspection. Eliminating unnecessary data or noise increases the speed at which information can be processed and limits the potential for false readings. One simple technique for restricting the light that reaches the CCD is the use of filters. There are several common, available filters including polarizing, band pass, and cut off.



Polarized Lighting: Polarizing filters provide an adjustable option for decreasing glare in an inspection. A two part process, the light is projected through a polarizing filter and then seen by the camera through an “analyzer.” Adjusting the orientation of the analyzer allows the viewer to modify the orientation of the light collected by the camera.

Band Pass Filters allow only a narrow range of wavelengths through to the camera. In settings where ambient light creates a variable inspection environment, the band pass filter removes all but a specific range of light, eliminating the need for a shroud around an inspection area.

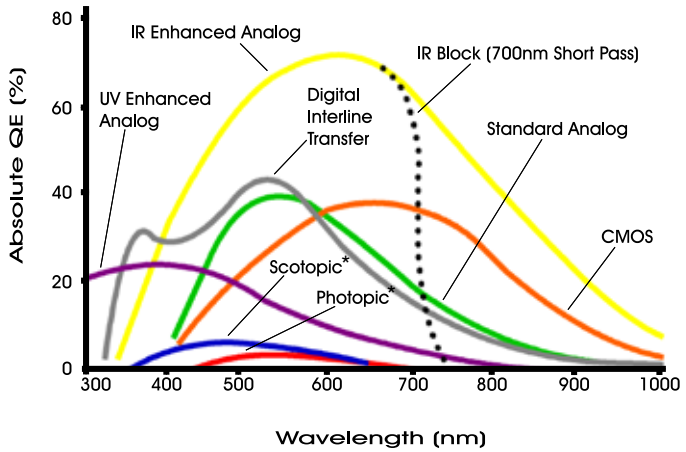
Cut Off Filters - also known as Short Pass or Long Pass - prevent light above or below a specific wavelength from being visible to the camera.



Light Wavelength and CCD Sensitivity

Light efficiency is partly determined by the sensitivity of the CCD to specific wavelengths. A CCD with peak reception between 620 - 700 nm will register more output from a 660nm (red) light than from a 470nm (blue) light source.

Infra-red (IR) is often overlooked as an illumination option. Invisible to the human eye, IR is useful for inspections in settings where a bright or flashing light might be distracting to workers. IR can be used to neutralize color differences, and has greater penetrating power, which is especially useful in plastics inspections.



*Photopic: Human Daylight Vision
*Scotopic: Human Night Time Vision

LIMITED TWO YEAR WARRANTY

Every Advanced illumination, Inc. (Ai) product is thoroughly inspected and tested before leaving the factory. Products are warranted to be free of defects in workmanship and materials for a period of TWO YEARS from the original date of purchase. Should a defect develop during this period, return the complete product, freight prepaid, to one of Ai's distributors or to the Ai factory. Ai will inspect the unit, and if a defect is found will, at our option, repair or replace the product without charge. Ai disclaims liability for any implied warranties, including implied warranties or "merchantability" and "fitness for a specific purpose."

Ai cannot be held responsible for the unauthorized or inappropriate use of our products.

NO LIABILITY FOR CONSEQUENTIAL DAMAGES.

In no event shall Advanced illumination, Inc. be liable for consequential, special, incidental or indirect damages of any kind arising from the sale or use of products.

RETURN POLICY

Standard Products may be returned within 30 days of receipt of the order. Products must be in resalable condition, in function and appearance, with shipping charges prepaid. A restocking fee of 15% will be applied to all items accepted for return to stock. If you need to make a return, please call our Customer Service Department at 802.767.3830 x237 or x222 for a Return Merchandise Authorization (RMA) number. Clearly mark the outside of the package with the RMA number.

NO RETURNS CAN BE ACCEPTED FOR STANDARD VARIATION, CUSTOM VARIATION AND CUSTOM PRODUCTS.

There are currently over 100,000 unique configurations of the Ai product line. Therefore, we cannot restock a light built to your specifications. We would be glad to help you order your light if you are unsure of the correct part number or your exact requirements.

PRODUCT CLASSIFICATIONS

Our lighting products are classified into the following groups:

Standard: standard product with an "off the shelf" configuration. Compatible with Ai's Signatech power sources and electronics.

The following categories are built to a customer's unique specifications and CANNOT be accepted for return. See RETURN POLICY.

Standard Variation: standard product with a custom configuration, built to order along standardized guidelines. Customization options can include standoff, field of view, spectral characteristics, and compatibility with user supplied power. Standard variations may be configured for use with Ai Signatech power sources.

Custom Variation: standard product with a custom configurartion that falls outside of the published Standard Variation guidelines. Customization options can include standoff, field of view, spectral characteristics, compatibility with user supplied power, or have customized parts. Custom Variations may be configured for use with Ai Signatech power sources, dependent upon specifications.

Custom: fully custom designed and built products; or standard products with modified mechanical and/or optical and/or electrical components.

ORDERING AND SHIPPING

Unless specified otherwise, all products are shipped as follows:

Domestic: UPS Ground; International: UPS Worldwide Express

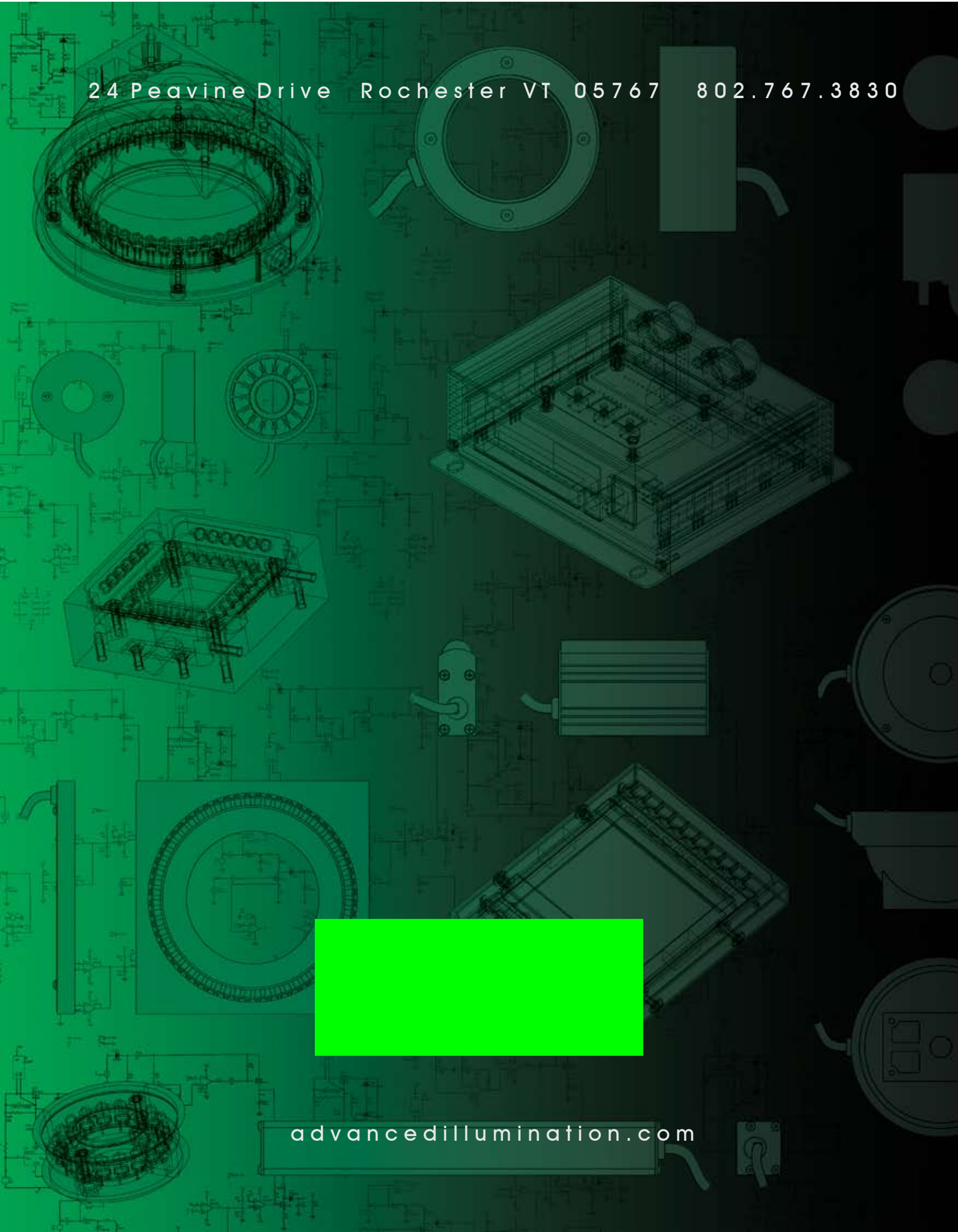
All shipments are FOB Rochester, VT. Federal Express or corporate account shipping can be arranged by contacting our Customer Service Department at 802.767.3830 x237 or x222.

PURCHASE ORDERS MUST ARRIVE AT THE FACTORY BY 12:00 NOON (EST) TO BE PROCESSED SAME DAY. Orders must be signed, detail the product ordered, and include customer's Purchase Order Number. Incomplete orders, or orders received after noon may not be processed until the next business day.

Standard product, when in stock, can be shipped within 24 hours after receipt of the PO. When not immediately available, standard product will be shipped within three business days after receipt of order.

Standard Variations will be made available for delivery 2 weeks after receipt of PO.

Expedited orders for Standard Variations require an additional charge *per item ordered.* Contact Customer Service for availability and pricing.



24 Peavine Drive Rochester VT 05767 802.767.3830

advancedillumination.com